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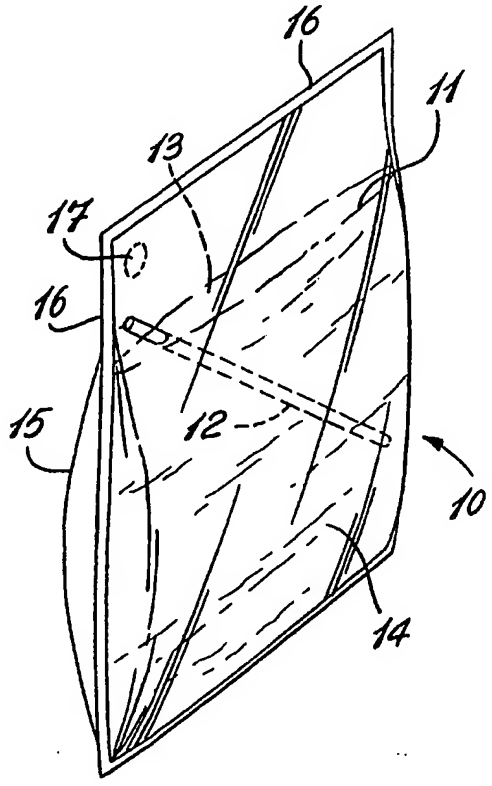
(54) Title: LIQUID PLASTIC FILM POUCH WITH INNER STRAW AND MACHINE AND METHOD OF MAKING

(57) Abstract

A liquid product carrying plastic film pouch (10) having a straw (12) free-floating in the liquid product (11) is described. The liquid product (11) contained within the inner chamber (13) of the pouch occupies from about 60 % to about 90 % of the volume of the inner chamber (13) of the pouch and a portion of air from the remaining volume is evacuated in sufficient quantity to permit the side walls (14, 15) of the pouch to be collapsed against one another when the pouch is grasped by the hand of a user person. By collapsing the side walls (14, 15) together the straw (12) located within the liquid can be grasped and manipulated to puncture the plastic film pouch (1) to extend a portion (12') of the straw (12) exteriorly of the pouch whereby to extract liquid therefrom. The pouch (10) is made of a multilayer resin film having an inner sealant layer (26) formed of a linear low density ethylene-octene copolymer or very low density ethylene copolymer (octene or other copolymers) such that when the straw punctures the film, the inner sealant layer (26) forms a membrane about the straw which exhibits a self-sealing behavior so as to prevent leakage in the punctured region as liquid is extracted from the pouch (10) through the straw (12). The machine and method of fabrication is also disclosed.



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LIQUID PLASTIC FILM POUCH WITH INNER STRAW AND MACHINE AND METHOD OF MAKING

TECHNICAL FIELD

The present invention relates to a sealed plastic film pouch containing a liquid and a free-floating straw therein and wherein air is evacuated from a space within the pouch to facilitate the manipulation of the pouch by collapsing its side walls to grasp the straw and puncture the pouch, and further wherein the bag is formed from a multilayer film having an inner sealant layer exhibiting a self-sealing behavior about the straw in the punctured area to provide a seal about the straw.

The invention also relates to the machine and method for making a sealed liquid pouch having a free-floating straw inside the pouch and more particularly to the means and method for inserting the straw within the pouch during the filling cycle of the pouch.

BACKGROUND ART

It is known to form package liquid containers with sealed plastic bags and wherein a straw-like object or extractor is held inside the bag and freely floating within the liquid contained therein. Such a liquid pouch container is, for example, described and illustrated in U.S. Patent 3,730,336 issued on May 1, 1973. Such package containers, however, have disadvantages in that it becomes difficult to manipulate the bag to grasp the straw and puncture the bag due to the amount of liquid and air held captive within the sealed bag. This manipulation often causes the bag to burst. It is also important to have an added extra volume within the bag in the event that it is desirable to freeze

the package with its liquid content as the extra volume will permit for expansion of the freezing liquid content.

It is desirable with such bags to provide straws with sufficient rigidity, such as polypropylene to puncture the bag without having an end of the straw cut on the bias and without having any means attached to the straw to permit its grasping to facilitate its movement within the bag as such means pose other disadvantages in the automatic assembly of the pouch with its liquid contents. It is also desirable with such package liquid containers to provide a container which is highly hygienic and which is formed of plastic material which will not impart off-taste (acidic taste) to a liquid contained therein and particularly if the liquid is present for a long period of time. It is further desirable with such packages to extend the shelf life thereof so that such packages with their liquid content can be maintained a long period of time before being used. It is also desirable to provide a plastic film pouch which can provide a seal about the straw when the bag is punctured and which can resist impact during handling and shipping.

It is also known to manufacture plastic film liquid pouches with a free-floating straw positioned therein. Certain methods of manufacture utilize forming the pouches by folding a film sheet horizontally and placing a straw in the lower folded section of the film strip well before the seals are made to produce an open-ended pouch with a straw therein ready to receive liquid. However, when producing such pouches from vertical forming machines where the film tube is formed in a vertical manner and particularly in a continuously liquid dispensing application, this task becomes much more difficult as

the straw must be positioned within the bag being formed as liquid is admitted in the bag due to the continuous liquid dispensing process. This poses several problems, one being the manner in which the straws can be dispensed into the liquid pouch being filled and also in synchronism with the pouch sealing cycle. Another problem is to ensure that the straw does not extend into the seal jaws after the open-ended pouch formed in the plastic tube is disposed for sealing the open top end to form the pouch. Another problem is to adapt straw dispensing mechanism to such bag forming and filling machines. It is also desirable, during the manufacture of these sealed liquid pouches, to evacuate some air from the space which is formed in the bag and which is necessary to provide for the expansion of the liquid, when it is frozen.

SUMMARY OF INVENTION

It is therefore a feature of the present invention to provide a plastic film pouch which overcomes the above-mentioned disadvantages of the prior art and which provides for the needs as above-mentioned.

Another feature of the present invention is to provide a sealed plastic film pouch having a liquid and a free-floating straw therein and wherein a predetermined quantity of air has been evacuated from a space contained within the inner chamber of the pouch.

Another feature of the present invention is to provide a sealed plastic film pouch containing a liquid and a free-floating straw therein and wherein the plastic film is a multilayer film having an inner sealant layer possessing a substantially self-sealing behavior about the straw in a punctured area of the

bag when in use whereby to provide a seal about the straw.

Another feature of the present invention is to provide a method of forming a plastic film pouch with a liquid and straw disposed in the pouch and which substantially overcome the above disadvantages of the prior art and which meets the required needs.

Another feature of the present invention is to provide a machine and a method for making a sealed liquid pouch with a free-floating straw inside the pouch, and which substantially overcomes the above-mentioned disadvantages.

Another feature of the present invention is to provide a machine for making sealed liquid pouches with a free-floating straw inside the pouch and wherein the straw is convected inside the pouch, during the formation of the pouch, by a convection tube and through which the straw freely falls by gravity.

Another feature of the present invention is to provide a machine for making a sealed liquid pouch with a free-floating straw inside the pouch and wherein the straw is inserted within the pouch being formed during the displacement cycle of the plastic film tube which forms the pouch.

Another feature of the present invention is to provide a machine for making a sealed liquid pouch with a free-floating straw inside the pouch and wherein the formed plastic film tube is continuously stretched laterally during the filling cycle and sealing cycles and in conjunction with the sealing jaws permits a certain quantity of air to be evacuated from the free space in the pouch being formed.

Another feature of the present invention is to provide a method of producing a sealed liquid pouch having a free-floating straw located in the pouch and

wherein a straw is simultaneously directed in the liquid through a convection tube as the bag is being filled and the tube being drawn to a sealing head.

Another feature of the present invention is to further provide a method of producing a sealed liquid pouch with a free-floating straw and wherein air is evacuated from the space within the pouch during the formation of the pouch.

According to the above features, from a broad aspect, the present invention provides a plastic film pouch for containing a liquid product. The film pouch has opposed side walls sealed about a peripheral edge thereof to define a sealed inner chamber. At least a portion of at least one of the side walls is formed of transparent film for visual access to the inner chamber. A straw of predetermined rigidity is located freely within the inner chamber. A liquid is contained within the inner chamber and occupies from about 60% to about 90% of the volume of the inner chamber. The remaining volume of the inner chamber has air evacuated therefrom in sufficient quantity to permit the side walls to be collapsed against one another to facilitate grasping the straw in the liquid and manipulating it to puncture the plastic film pouch whereby to extend a portion of the straw exteriorly of the pouch to extract liquid from the pouch.

According to a further broad aspect of the present invention, there is provided a method of forming a plastic film pouch with a liquid and straw disposed in the pouch. The method comprises the steps of drawing a film web having opposed side walls positioned in juxtapose to a filling and sealing station. Edge seals are formed at the filling and sealing station to form a pouch having an open-top-end and defining an inner chamber. A straw, having a predetermined rigidity, is inserted in the inner

chamber through the open-top-end. A predetermined volume of liquid is then inserted in the inner chamber through the open-top-end to occupy from about 60% to about 90% of the volume of the inner chamber and thereby defining a vacant space thereabove. The opposed film side walls are then collapsed together in a portion of the vacant space to expel air therefrom through the open-top-end. A top edge of the two juxtaposed side walls are then sealed together adjacent the open-top-end whereby to form a pouch having a liquid and a free-floating straw therein with air evacuated in sufficient quantity to permit liquid to be displaced within the inner chamber when opposed side walls of the pouch are collapsed towards one another to grasp the straw in the liquid and to manipulate it to puncture the plastic film whereby to extend a portion of the straw exteriorly of the pouch to extract liquid from the pouch.

According to another broad aspect, the present invention provides a machine for making a sealed liquid pouch with a free-floating straw inside the pouch. The machine comprises bag forming means for making a bag from impervious plastic film material. A filler mechanism is provided for placing a liquid inside the bag. A straw convecting means is provided for directing a straw in the pouch prior to sealing the pouch.

According to a further broad aspect of the present invention there is provided a method of producing a sealed liquid pouch having a free-floating straw located in the liquid within the pouch. The method comprises the steps of folding and sealing a plastic film sheet to form a film tube having an open-top end. Liquid is inserted in the film tube and simultaneously a straw is directed through a straw convection tube for discharge into the liquid in the

plastic film tube. The plastic film tube is displaced downwardly to a sealing jaw where a seal is formed at an open top end of a filled film tube section to form the sealed liquid pouch. The seal also forms a bottom edge seal of another tube section being filled.

BRIEF DESCRIPTION OF DRAWINGS

A preferred embodiment of the present invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view showing a plastic film pouch constructed in accordance with the present invention and wherein a liquid and a straw is contained within an inner chamber formed by the sealed pouch;

FIG. 2A is a plan view of the plastic film pouch of FIG. 1 and wherein the pouch is formed entirely of transparent plastic materials;

FIG. 2B is a plan view showing the plastic film pouch formed with an opaque rear wall and a partly opaque and partly transparent front wall;

FIG. 3 is a perspective view showing how the straw inside the plastic film pouch is manipulated to puncture a corner portion of one of the side walls whereby a portion of the straw can be exposed to extract liquid from the pouch;

FIG. 4 is a perspective view showing the pouch partly in section to show how the side walls of the pouch are collapsed to grasp the straw;

FIG. 5 is an exploded view showing a sealing membrane formed about the straw by the inner sealant layer of the film which exhibits a self-sealing behavior;

FIG. 6 is a section view showing the composition of the multilayer resin film;

FIG. 7 is a simplified side view illustrating the method of forming the plastic film pouch with the liquid and straw inserted therein and the manner in which air is evacuated and in which the bag is sealed;

FIG. 8 is a simplified side section view further illustrating how the bag is formed and particularly how air is extracted from the bag and how the top and bottom seals are formed;

FIG. 9 is a simplified perspective view showing a machine constructed in accordance with the present invention for making filling and inserting a straw in the liquid contained within a liquid pouch;

FIG. 10 is a perspective view showing the liquid pouch with the free-floating straw therein and formed in accordance with the present invention;

FIG. 11 is a simplified schematic view showing the manner in which the film sheet is formed into a vertical plastic tube to form the pouches as shown in Figure 2;

FIG. 12 is a schematic perspective view showing the straw storage and dispensing mechanism of the present invention;

FIG. 13A is a simplified section view showing the construction of the sealing jaws;

FIG. 13B is a view similar to Figure 5A but showing a modification of the sealing jaws to provide a means to expulse air from the bag being formed;

FIG. 14 is a top schematic view showing the construction of the plastic tube engaging and displacing mechanism; and

FIGs. 15A to 157C are schematic plan views showing the dispensing of the straw within the plastic bag being formed.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings and more particularly to Figure 1, there is shown generally at 10 the sealed plastic film pouch of the present invention. A liquid product 11, as well as a free floating straw 12, are contained within an inner chamber 13 of the pouch 10. The plastic film pouch has opposed side walls 14 and 15 which are sealed about a peripheral edge 16 thereof. As hereinshown the pouch 10 is formed of transparent film material whereby to provide visual access to the free-floating straw 12 and the liquid product. Of course, the film material may be printed while still providing visual access to the inner chamber thereof. As hereinshown the front side wall 14 is provided with a printed target area 17 to indicate to the user where it is preferable to puncture the bag, although the straw can be oriented to puncture other areas, but the corners are preferred.

The liquid product 11 contained within the bag occupies from about 60% to about 90% of the volume of the inner chamber 13. The remaining volume of the inner chamber has a portion of air evacuated therefrom in sufficient quantity to permit the liquid to be displaced by collapsing the side walls against one another to facilitate grasping of the straw. Preferably, although not exclusively, the liquid product contains approximately 84% of the volume of the inner chamber. Also, these pouches are preferably, although not exclusively, dimensioned to contain liquid products in volumes from 3 ounces to 24 ounces.

As shown in Figures 2A and 2B, the plastic film pouch 10 is of rectangular shape and is provided with a bottom seal 18, opposed side seals 19 and 19' and a top seal 20 about the opposed side walls 14 and

15 whereby to form a rectangular transparent film pouch. It is pointed out that the film pouch need not be entirely transparent and as shown in Figure 2B, the rear side wall 15 is formed with a pigment to provide a solid colored wall which is not transparent. On the other hand, the front wall 14 may have opaque colors printed on portions 14' thereof while maintaining a large transverse transparent section 14' for visual access of the straw 12 located within the pouch. Of course, printed matter may also be applied across the transparent section 14", provided one can still see through the transparent section to locate the straw.

With reference now to Figures 3 to 5, there will be described the manner in which the plastic film pouch is used to puncture it with the inner straw and to extract the liquid. As shown in Figure 4, because air has been evacuated from the pouch, it is possible to collapse the opposed side walls 14 and 15 by pinching the pouch with the fingers 21 to grasp the straw 12 with one hand. This permits the user to manipulate the straw to position an end thereof adjacent the target area 17 as shown in Figure 3. With the fingers 22 of the other hand, the user grasps a corner area 23 of the pouch and folds it downwardly in the direction of arrow 24 against the straw free end 12' with the target area 17 or an area close thereto being pulled against the free end 12' whereby the free end 12' will puncture the film and exit the bag as shown in Figure 5.

In order to obtain a good seal between the straw side wall 12" and the punctured hole 25, a multilayer resin film material having an inner sealant layer 26 is utilized. Such a multilayered film material is illustrated in Figure 6 and it consists of a laminated or extrusion-coated plastic film comprising an inner sealant layer 26 which is selected

from a linear low or very low density ethylene-octene copolymer or a metallocene linear low density polyethylene. Preferably, the sealant layer has a density of 0.900 g/cm^3 and above. The co-extruded resin film also has at least a different outer polymer 27 or an additive which is preferably a multilayer resin film blend of high pressure polyethylene or other linear low density ethylene-octene copolymer. It may also have a pigmented resin core 28 if it is desirable to form the pouch with an opaque back wall 15 as previously described. The core could be a barrier material, such as Nylon, PET, PVDC, PP EVOH, for example. Such a multilayer resin film provides for the fabrication of a pouch having excellent impact and flexural properties to prevent leaking and exhibits low heat seal initiation temperatures to permit high speed sealing of the pouch. It is preferable with these pouches that they be strong and defect-free, that is to say that there are no pin holes or folds which could lead to leaking pouches.

As the pouches are typically made on a vertical formed fill seal packaging machine, the hot tack properties of the film are important. The multilayer film as shown in Figure 6 combines different resins or additives in one or more layers in order to achieve specific performance properties of the pouch 10. As above-described, the important aspect of this multilayer film is the inner sealant layer 26. Metallocene low density ethylene-octene copolymer is preferred as it does not impart off-taste, that is to say it does not impart an acidic taste to the liquid product when contained within the bag over a long period of time. It also improves the shelf life of the liquid product within the pouch. Another polymer material such as EVOH or PET could be used to provide barrier characteristics to the pouch.

Furthermore, lower cost LLDPE butene or LDPE could be used in the core to reduce costs.

With reference to Figure 5 it can therefore be appreciated that because the inner sealant layer 26 exhibits a substantially self-sealing behavior about the straw, it forms a sealing membrane 29 all about the straw side wall 12" to prevent liquid from seeping through the punctured hole 25. The liquid product from the straw can be extracted by squeezing the bag to expulse the liquid through the straw 12 or else the liquid may be sipped out of the pouch through the free end 12' of the straw.

With reference now to Figures 7 and 8, there will be described a method of forming the plastic film pouch 10 of the present invention with a liquid 11 and a straw 12 disposed in the pouch. This pouch 10 is formed in a vertical form fill seal packaging machine, not shown, and in which the two film sheets 14 and 15 are brought in juxtaposition but separated from one another, as shown in Figure 7, and drawn on opposed sides of a filler tube 30. The liquid product 11 flows from the dispensing end 31 of the filler tube after the bottom seal 18 and side seals 19 and 19' have been formed. Accordingly, the two plastic resin film sheets 14 and 15 are drawn in juxtaposition to a sealing and filling station 32 which is shown in Figures 7 and 8. At this station the side seals 19 and 19' are formed as the bottom seal 18 was already formed when the top end of the bag was sealed, as will be described. The seals may be formed using impulse or constant heat techniques or using any other convenient sealing system, such as ultrasonic sealing.

By forming the side seals 19 and 19' a pouch having an open top end 33 is formed. The straw 12 is then injected into the open top end pouch by a straw injector, as will be described later, through the

space 34 as shown in Figure 8. The filler tube then quickly dispenses a predetermined quantity of liquid product within the open ended pouch and as previously mentioned this product will fill from about 60% to about 90% of the volume of the inner chamber of the pouch and preferably, but not exclusively, 84% of this chamber. During the filling, the pouch can also be held by clamps, not shown. As soon as the liquid is dispensed the filler tube 30 is retracted with the liquid product reaching its maximum level as indicated by reference numeral 35. Alternatively, the open-top-end pouch could be advanced after the filling. As soon as the filler tube is retracted, or its pouch advanced, a pair of clamping arms 36 and 36' will clamp the bag in the area depicted between the broken lines 37, as shown in Figure 6, and spaced from the open top end 33 of the bag, whereby to expel air from the space on top of the liquid level surface 35. The heat sealing head 38 and its back plate 39 then move together to seal the top edge portion 40 of the open-top-end bag to form the top seal 20 and simultaneously the bottom seal 18 of the next bag to be formed is also formed. As hereinshown the sealing head 38 is provided with a series of perforating prongs 41 to form a perforated line 42 between the seals 18 and 20 whereby the bags can be later separated from the strip of bags being formed, as shown in Figure 8.

Referring now to Figure 9, there is shown a vertical pouch forming machine 100 which comprises a housing 111 having a dispensing conveyor 112 thereunder for dispensing liquid pouches 113 that are formed by the machine. Because the liquid contained within the pouches 113 is for human consumption, it is important to maintain the machine in a sanitary environment and for this reason the vertical bag-forming mechanism 114 is located inside the housing

111 with air evacuated therefrom and access thereto is provided by a door 115 having a transparent glass panel 116 to provide visual access to the machine to visualize the operation thereof and to detect any malfunctions of its mechanisms. A control panel 117 provides adjustment and control for the various mechanisms within the machine. A straw dispensing magazine 118 is conveniently positioned on the top wall 119 of the housing 111 and feeds, in a synchronized manner, straws 120 from the magazine to the top end of a straw dispensing tube 121 which extends to or over the top end 119. A liquid reservoir 122 or a feed pipe (not shown) feeds liquid to a dispensing filler tube or spout tube 123.

As shown in Figure 10, the vertical forming machine 100 forms the sealed liquid pouch 113 which contains therein a substantially predetermined quantity of liquid 124 and a straw 120 which is freely floating therein. During the formation of the bag from a sheet of film material, a transverse seal 125 is formed across one of the side panels 126 of the bag 113 and opposed side edge seals 127 and 128 are also formed. The end edges 129 and 129' do not have seals as they were formed by folding the plastic film sheet, as will be described later. The end edge 129' may constitute the top end of the formed bag. The side panels 126 usually contain printed matter as is described in our above-referenced co-pending patent application.

Referring now to Figure 11 there is schematically illustrated the construction of the vertical bag-forming mechanism 114. It comprises a plastic film tube forming head 130 which gathers opposed side edge portions 131 and 131' of a film sheet 132 which is pulled from a roll of film material, not shown, and conveniently located within

the housing 111 or externally of the housing and guided by guide rolls 133. This forming head is known in the art and its purpose is to fold the sheet and overlap the side edge portions 131 and 131' by guiding the side edge portions about the head 130 and under a guide finger 134. This forms a hollow plastic tube 135. As hereinshown and with further reference to Figure 14, it can be seen that this hollow plastic film tube 135 is formed about the filler spout 123 as well as the straw dispensing tube 121 which extends in a side-by-side relationship with the filler tube 123. The hollow plastic film tube 135 is advanced or pulled in a downward direction, as indicated by arrow 136 by a tube engaging drive mechanism 137. As shown in Figure 14, this tube engaging drive mechanism comprises a stationary support frame 138 in which is supported opposed pairs of film engaging drive wheels 139 and 139'. Each pair of drive wheels 139, 139' engage an outer side edge portion 140 and 140' of the film tube 135. A drive motor, not shown herein, actuates these wheels which are in frictional engagement from opposed sides of the side edge portions 140 and 140' of the film tube 135 whereby to draw the film downwardly through the frame 138, a predetermined distance as adjusted by the speed and time of operation of the wheels. This tube engaging drive 137 is only actuated between the opening and closing cycles of the sealing mechanism 141 which will be described later.

With further reference to Figure 11, while the sealing mechanism 141 is actuated, there is further actuated in synchronism therewith, a vertical sealing mechanism 142 which seals the overlapped outer edge portions 131 and 131' of the film sheet 132 along a predetermined length. Accordingly, below the vertical sealing head 142 there is formed an open-

ended hollow plastic film tube. The vertical sealer is well known in the art and will not be described in detail herein. The filler tube or liquid dispensing spout 123 has a liquid dispensing end 123' positioned a predetermined distance above the sealing mechanism 141. A tube expanding means in the form of a pair of outwardly biased pusher arms 143 and 143' are secured to opposed sides of the filler spout adjacent the liquid dispensing end 123' thereof and are spring-biased outwardly by a spring mechanism not shown herein. These pusher arms 143 have smoothly curved outer ends 144 and are of narrow thickness whereby to engage the inner side ends 145 of the hollow plastic film tube 135. Their purpose is to maintain the tube taught and expanded in the area of the liquid dispensing lower end of the filler spout and also in the area of the transverse sealing mechanism 141 in order to eliminate creasing along the seal.

As shown in Figure 13A, the transverse sealing mechanism 141 is constituted by a pair of jaw plates 146 and 147 with the jaw plate 147 constituting a bumper and displaceable against the jaw plate 146 which is provided with a sealing diaphragm 148 behind which a sealing wire 149 extends to form a seal across the plastic tube 135. A pair of gripper elements 150 are also provided in the inner faces 147' and 146' of the jaw plates 147 and 146, respectively, whereby to engage a top end portion of the lower filled pouch 113' and a lower bottom end portion of the upper tube section of the bag 113" being formed. As can be seen, because these sealing heads project from the inner faces of the jaw plates, they also expulse a small quantity of air from the space 151 above the liquid level 124' of the liquid 124 in the pouch 113', when closed.

Figure 13B shows a modification of the jaw plates 146 and 147 and as hereinshown the inner face 146' of the jaw plate 146 is provided with a pair of cavities, namely a lower cavity 152 and an upper cavity 153. The lower cavity is deeper than the upper cavity and these longitudinal cavities are shaped to receive therein longitudinal protrusions or bars 154 and 155, respectively. The lower protrusion 154 extends from the inner face 147' of the jaw plate 147 a distance greater than the other protrusion 155. The reason for this is as the jaw plates 146 and 147 close, the lower protrusion 147' will expulse air from the space 151 as the opposed walls of the plastic film tubes collapse in a split second before the other protrusion 155 engages an upper part of the bag walls prior to the sealing wire 149 contacting the collapsed walls to form the seal. The upper protrusion 155 only performs a bag grasping and collapsing operation. It is important to grasp the lower end of the bag above the sealing head as liquid is continuously fed into the hollow tube by the spout.

Referring now to Figure 12, there will be described the construction and operation of the straw storage and convecting means. As shown in Figure 11, the straw convection tube 121 is a straight tube which extends from an upper straw receiving end 121' to a lower dispensing end 121". As better seen in Figure 12, the straw dispensing magazine 118 is a storage container, loaded from the top, and herein formed of transparent plastic material and has opposed parallel side walls 160 and opposed end walls 161. The top portion of the magazine is substantially rectangular and dimensioned to contain a plurality of the straws 120 therein and all oriented in a substantially parallel manner. The bottom end of the rectangular upper portion has a funnel-shaped lower section 162

whereby to direct straws into a dispensing throat portion 163 at the bottom of the lower section 162. Straws are aligned in this throat portion in parallel side-by-side relationship and in a single row 164 as hereinshown. A straw access aperture 165 is formed in at least one of the space side wall extensions 166 which forms the dispensing throat portion 163. The access aperture may also be provided in the opposed side wall 166 and this permits access to the straws should there be blockage or a malfunction in the throat area.

Transfer means in the form of a piston actuated pusher rod 167 is also provided. The pusher rod 167 is secured to a piston cylinder 168 for axial displacement of the pusher rod. The pusher rod is reciprocated at between 40 to 60 lbs pressure. The pusher rod has a straw engaging end 169 and the rod is dimensioned so as to extend through a discharge opening 170 formed at the bottom of the dispensing throat portion 163 whereby to engage an end of the lowermost one of the straws 120, and shoot it out of the dispensing throat portion 165 at a high velocity and into a guide tunnel 171. Because the pusher rod 167 extends through the discharge opening 170 the straw which was lying on top of the discharged straw within the discharge throat portion cannot fall into the discharge opening 170 due to the fact that it is occupied by the pusher rod which is of circular cross-section much like the straw. The piston cylinder 168 is also operated in synchronism with the transverse sealing mechanism 141.

As shown in Figure 12, the guide tunnel 171 is formed by opposed side walls 173 and a curved end wall 172 to maintain the straw oriented for discharge within the convection tube 121. The curved end wall 172 has a curved shape designed to cause the straw to

orient itself from a horizontal position, at the discharge opening 170, to a vertical position and in a guided manner whereby the straw will enter the open top end 121' of the straw convection tube 121 and fall by gravity therein to be released within the bag. As hereinshown, an oscillating plate 174 is disposed in the funnel-shaped lower section 162 adjacent the top end of the dispensing throat section 163 whereby to cause the straws adjacent the dispensing throat section, to adopt a substantially parallel orientation.

Although not shown it is also contemplated that a loading and discharging turret may be provided between the discharge opening 170 of the straw dispensing magazine 118 and the open top end 121' of the straw convection tube 121. The turret would have four straw receiving cavities disposed at 90 degrees to one another and wherein the pusher rod 167 would push the lowermost one of the straws 120 into one of the straw receiving cavities. The turret would then be indexed or displaced 90 degrees and at the same time clamping the loaded straw in position. When the straw receiving cavities reach a vertical position after 270 degrees of rotation, the retention means or straw clamping means would release whereby the straw at the 270 degree position would be released in the open top end 121' of the straw convection tube 121.

Referring now to Figures 15A to 15C and particularly in Figure 15A, it can be seen that the straw dispensing end 121" of the straw dispensing tube 121 is located a distance high enough from the dispensing end 123' of the liquid dispensing tube 123, and from the top edge 137' of the jaws 137, sufficiently to permit the straw 120 to be ejected from the dispensing tube 121 and into the liquid 124' which is quickly rising within the plastic film tube

portion 113" being filled. As previously described, as the jaws 137 open, the plastic film tube 135 is drawn downwardly at a predetermined speed which is synchronized to the amount of liquid entering the hollow plastic film tube or pouch 113" being formed. One of these pouches can be formed approximately every second. Accordingly, as the straw 120 is released within the pouch being formed, the pulling action on the hollow plastic film tube 135 causes the straw to tilt freely towards the filler spout 123, as shown in Figure 15B. This action is fairly quick as a bag is being formed in less than one second with about 175 percent of the bag filled with the liquid. As the straw tilts it clears the top portion of the bag 113' to be formed sufficient to clear the jaw plates 146 of the sealing mechanism 141.

Summarizing the method of operation, a sealed liquid pouch with a free-floating straw, as shown in Figure 10, is formed by the steps of convecting a plastic sheet about a tube forming head to form a film tube having an open-top end whereby liquid can be inserted within the film tube through a filler spout 123. Simultaneously, a straw is directed through a straw convection tube 121 and is discharged within the plastic film tube in the liquid being dispensed in a pouch being formed. As the plastic tube is pulled downwardly, and the straw tilts whereby to clear sealing jaws which form a seal at an open top end of a filled film tube section to form the sealed liquid pouch and simultaneously to form a bottom edge seal of another tube section being filled. The straw is transferred from a straw storage magazine to a loading location where it is re-oriented to enter an upper straw receiving end of the straw convection tube, which is a straight tube, and wherein the straw falls by gravity therethrough and into the pouch being

formed. The plastic tube is continuously maintained in a stretch condition and by doing so the opposed walls are close together and this evacuates air from the space provided in the pouch. Leak-proof side edge seals are formed to constitute the sealed pouch. The sealing jaw plates are also provided with a gripping means which may be adapted to further expulse air from the space in the bag being formed as well as perform their gripping function as above-described.

It is within the ambit of the present invention to cover any obvious modifications of the preferred embodiment described herein, provided such modifications fall within the scope of the appended claims.

CLAIMS,

1. A plastic film pouch for containing a liquid product, said film pouch having opposed side walls sealed about a peripheral edge thereof to define a sealed inner chamber, at least a portion of at least one of said side walls being formed of transparent film for visual access to said inner chamber, a straw of predetermined rigidity located freely within said inner chamber, a liquid contained within said inner chamber and occupying from about 60% to about 90% of the volume of said inner chamber, the remaining volume of said inner chamber having a portion of air evacuated therefrom in sufficient quantity to permit said liquid to be displaced within said inner chamber when said side walls are collapsed towards one another to grasp said straw in said liquid and manipulate it to puncture said plastic film pouch whereby to extend a portion of said straw exteriorly of said pouch to extract liquid from said pouch.

2. A pouch as claimed in claim 1 wherein said liquid product contains approximately 84% of said volume of said inner chamber.

3. A pouch as claimed in claim 1 wherein indicator means is provided on an exterior surface of said pouch in a top corner area thereof to indicate to a user person where to orient a free end of said straw intended to puncture said bag.

4. A pouch as claimed in claim 1 wherein said pouch is dimensioned to contain said liquid product in volumes from 3 ounces to 24 ounces.

5. A pouch as claimed in claim 1 wherein said plastic film is a multilayer film having an inner sealant layer and at least a different outer polymer or additive, said inner sealant layer being a low density copolymer or polyethylene which does not impart acidic taste.

6. A pouch as claimed in claim 5 wherein said inner sealant layer is selected from a linear low or very low density ethylene copolymer, or metallocene linear low density polyethylene.

7. A pouch as claimed in claim 6 wherein said inner sealant layer has a density of 0.900 g/cm^3 and above.

8. A pouch as claimed in claim 5 wherein said multilayer film is composed of a blend of linear low, very low density or metallocene polyethylene with high pressure polyethylene or other linear low density ethylene-octene copolymer to provide a pouch with excellent impact and flexural properties and to prevent leaking, said multilayer resin film also exhibiting low heat seal initiation temperatures to permit high speed sealing of said pouch.

9. A pouch as claimed in claim 5 wherein said inner sealant layer of said multilayer resin film forms a membrane which exhibits a substantially self-sealing behavior about said straw in the area of said puncture due to the fact that the yield point of said inner sealant layer has not been exceeded.

10. A pouch as claimed in claim 6 wherein said ethylene copolymer is octene or other copolymer.

11. A machine for making a sealed liquid pouch with a free-floating straw inside the pouch, said machine comprising bag-forming means for making a bag from impervious plastic film material, a filler mechanism for placing a liquid inside said bag, and a straw convecting means for directing a straw in said pouch prior to sealing said pouch.

12. A machine as claimed in claim 11 wherein said straw convecting means is a convection tube through which said straw is convected by gravity, said tube having a lower dispensing end located in said bag at a predetermined position.

13. A machine as claimed in claim 12 wherein said convection tube is a straight tube extending from an upper straw receiving end to said lower dispensing end.

14. A machine as claimed in claim 12 wherein said machine is a vertical bag forming machine having a vertically oriented filler spout located internally of a plastic film tube having a sealed bottom end, said filler spout having a liquid dispensing lower end, said lower dispensing end of said tube being disposed within said plastic film tube and spaced above said liquid dispensing lower end of said filler spout to release a straw in said plastic film tube during dispensing of liquid within said plastic film tube.

15. A machine as claimed in claim 13 wherein there is further provided a straw dispensing magazine having a plurality of straws oriented in parallel relationship therein, said magazine having a dispensing throat portion in which straws are aligned

in parallel side-by-side relationship, and transfer means to displace an outer end one of said straws from a discharge end of said dispensing throat portion to said upper straw receiving end of said convection tube in synchronism with said bag forming means.

16. A machine as claimed in claim 15 wherein said transfer means comprises a piston-actuated pusher rod aligned for pushing engagement with an end of said outer end one of said straws to shoot same into a straw orienting guide tunnel positioned above said upper straw receiving end of said convection tube.

17. A machine as claimed in claim 16 wherein said piston-actuated pusher rod is an elongated rod which extends through said discharge end of said dispensing throat portion during a straw ejection stroke to prevent a next outer end one of said straws from movement to said discharge end of said dispensing throat portion until said pusher rod has completely retracted from its straw ejection stroke.

18. A machine as claimed in claim 16 wherein said straw orienting guide tunnel is comprised by a guide tunnel having a curved lower guide wall, said straw being shot into said tunnel against a curved end wall whereby said straw will orient itself from a horizontal position to a vertical position in a guided manner by said tunnel and enter said upper straw receiving end of said convection tube where it falls by gravity.

19. A machine as claimed in claim 15 wherein said straw dispensing magazine is further provided with an oscillating plate whereby to maintain said

straws in said container and adjacent said dispensing portion in substantially parallel orientation.

20. A machine as claimed in claim 15 wherein said dispensing throat portion is provided by a pair parallel spaced side wall extensions of said straw dispensing magazine, there being a straw access aperture in at least one of said spaced side wall extensions.

21. A machine as claimed in claim 14 wherein said bag forming means comprises a plastic film tube forming head for folding a film sheet and disposing opposed side edge portions of said film sheet in overlap relationship, a vertical sealer for sealing said overlapped side edge portions together to form said plastic film tube, a tube engaging drive mechanism for displacing said tube in a sequential manner, a transverse sealing mechanism for forming a bottom and top seal across said tube, and tube expanding means to maintain said tube in a transverse expanded condition to effect an uninterrupted top seal of a filled plastic tube portion to form one of said sealed liquid pouches and a bottom seal of a plastic tube portion now being filled.

22. A machine as claimed in claim 21 wherein said tube expanding means comprises a pair of outwardly biased pusher arms secured to opposed sides of said filler spout and frictionally engaging opposed inner side ends of said plastic film tube to maintain said tube expanded and taunt in the area of said liquid dispensing lower end of said filler spout and in the area of said transverse sealing mechanism.

23. A machine as claimed in claim 22 wherein said transverse sealing mechanism is constituted by a pair of jaw plates, one of said plates having a sealing head, the other of said plates being a press plate, and gripping means associated with said pair of jaws to grip in a sealing fashion an upper end of a filled bag and a lower end of a bag being filled during a bag filling cycle.

24. A machine as claimed in claim 21 wherein said bottom seal and top seal formed across said tube constitute opposed side edges of said pouch.

25. A machine as claimed in claim 23 wherein said pair of jaw plates are further provided with air evacuation means to remove air from a top portion of said bag being filled as said jaws close and prior to forming said seals.

26. A machine as claimed in claim 25 wherein said air evacuation means is constituted by said gripping means being formed by large elongated protrusions extending from a matting surface of one of said jaw plates and cavities in said other of said jaw plates for receiving said protrusion therein, said lower protrusion extending a greater distance from said matting surface than said upper protrusion.

27. A machine as claimed in claim 22 wherein said pair of outwardly biased pusher arms are their arms whereby said plastic film tube when expanded has opposed side walls thereof closely spaced whereby not to have a large volume of air above the liquid and below a top edge seal of said pouch, said expanding means constituting an air evacuation means.

28. A machine as claimed in claim 21 wherein said tube engaging drive mechanism is a stationary drive frame having opposed pairs of film engaging drive wheels, each pair of drive wheels engaging therebetween an outer side edge portion of opposed outer side edge portions of said film tube, said pairs of wheels when actuated drawing said film tube a predetermined distance in a downward motion, said filler spout being an elongated tube extending inside said film tube and between said pairs of drive wheels.

29. A machine as claimed in claim 23 wherein said filler spout is a continuous liquid discharge spout, said straw being discharged into said pouch immediately after said pair of jaw plates close, said tube engaging drive mechanism dispensing said plastic film tube downwardly during a filling cycle and after said jaw plates open, said straw exiting said dispensing end of said straw convecting tube during dispensing of liquid as said plastic film tube is drawn down, said straw tilting freely towards said filler spout in a partly submerged manner spaced downwardly from a top end portion of said pouch to be formed and below said jaw plates prior to said jaw plates closing again.

30. A method of producing a sealed liquid pouch having a free-floating straw located in the liquid within the pouch, said method comprising the steps of:

i) folding and sealing a plastic film sheet to form a film tube having an open-top end,

ii) inserting liquid in said film tube,

iii) simultaneously directing a straw through a straw convection tube for discharge into liquid rising in said plastic film tube,

iv) displacing said plastic film tube downwardly, and

v) forming a seal at an open top end of a filled film tube section to form said sealed liquid pouch, and to form a bottom edge seal of another tube section being filled.

31. A method as claimed in claim 30 wherein said step (iii) comprises the steps of:

a) transferring a straw from a straw storage container to a loading location, and

b) orienting said straw at said loading location to enter an upper straw receiving end of said straw convection tube where said straw falls by gravity through said convection tube.

32. A method as claimed in claim 31 wherein there is further provided the step of continuously maintaining said plastic film tube in an expanded condition by expanding means.

33. A method as claimed in claim 30 wherein said step (iv) comprises the steps of:

a) engaging opposed outer end edges of said plastic film tube between a respective pair of drive wheels, and

b) actuating said drive wheels for a predetermined time cycle after said sealing step (v).

34. A method as claimed in claim 30 wherein said step (v) comprises the steps of:

a) closing a pair of jaw plates against said plastic film tube,

b) simultaneously engaging in a sealing fashion, by gripping means in said plates, an upper end of a filled plastic film tube section and a lower end of a plastic film tube section being filled, and

c) simultaneously forming said seal.

35. A method as claimed in claim 34 wherein said gripping means also effect the step of evacuating some air from said filled plastic film tube prior to forming said seal.

36. A method as claimed in claim 30 wherein said step (i) comprises the steps of:

a) drawing a plastic film sheet over a forming head and about a liquid dispensing spout and said straw convection tube,

b) folding said film sheet and disposing opposed side edge portions of said plastic film sheet in overlap relationship,

c) sealing a section of said overlapped side edge portions together during said step (v).

37. A method of forming a plastic film pouch with a liquid and straw disposed in said pouch, said method comprising the steps of:

i) drawing a film web having opposed side walls to a filling and sealing station,

ii) forming one or more edge seals at said filling and sealing station to form a pouch having an open-top-end and defining an inner chamber,

iii) inserting a straw having a predetermined rigidity in said inner chamber through said open-top-end,

iv) inserting a predetermined volume of liquid in said inner chamber through said open-top-end to occupy from about 60% to about 90% of the volume of said inner chamber and to define a vacant space thereabove,

v) collapsing said opposed side walls together in a portion of said vacant space to expel air therefrom through said open-top-end, and

vi) sealing a top edge of said opposed side walls together adjacent said open-top-end whereby to form a pouch having a liquid and a free-floating straw therein with air evacuated in sufficient quantity to permit displacement of said liquid therein when opposed side walls of said pouch are collapsed against one another to grasp said straw in said liquid and manipulate it to puncture said plastic film whereby to extend a portion of said straw exteriorly of said pouch to extract liquid from said pouch.

Fig. 1

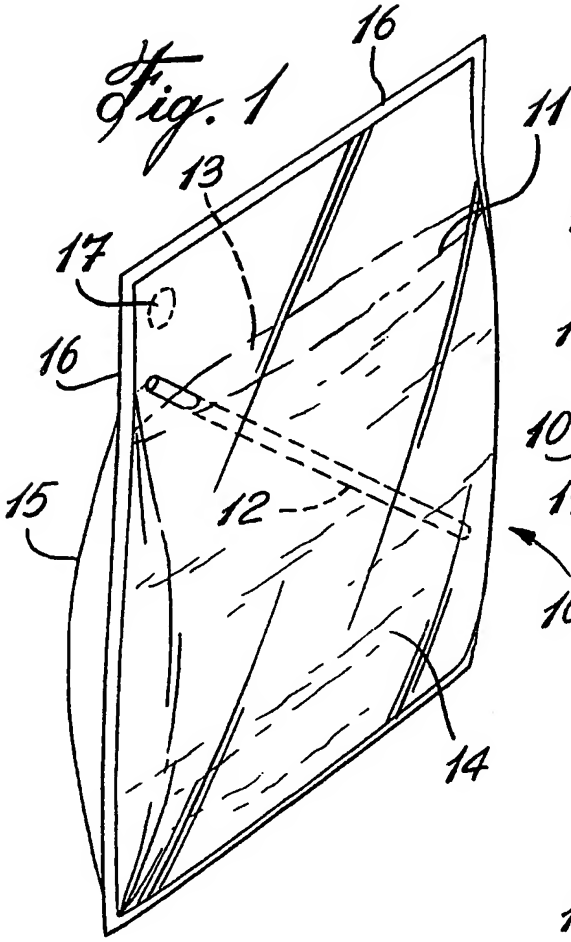
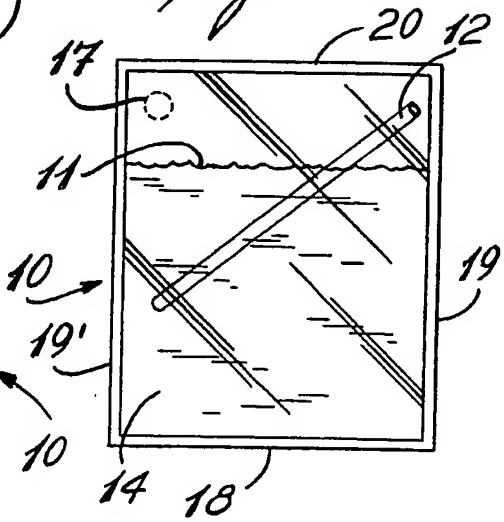


Fig. 2A



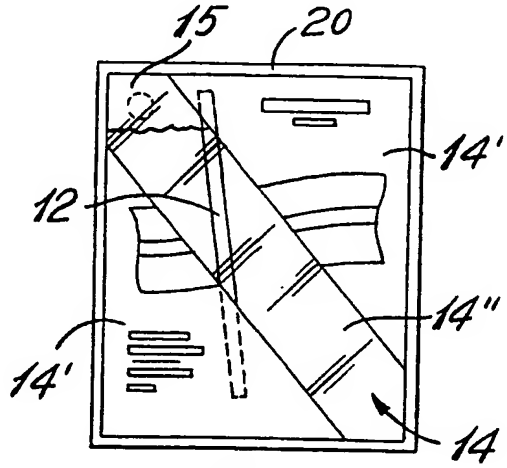


Fig. 2B

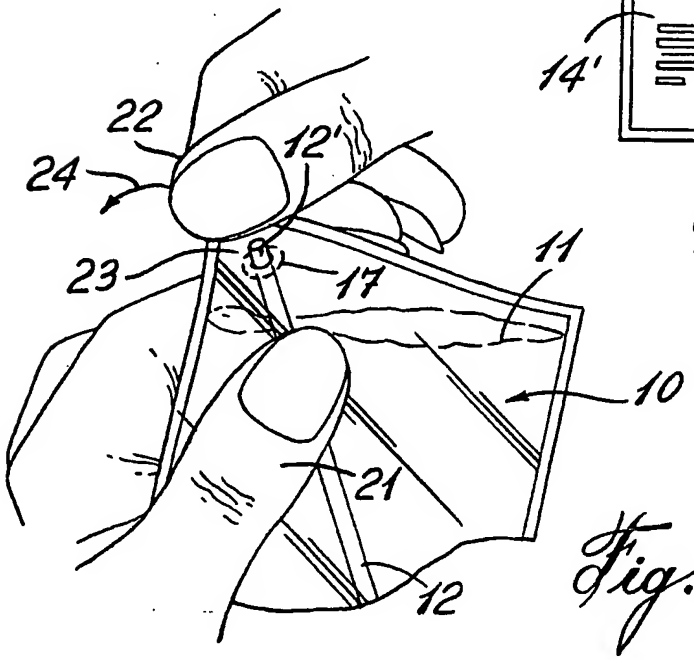


Fig. 3

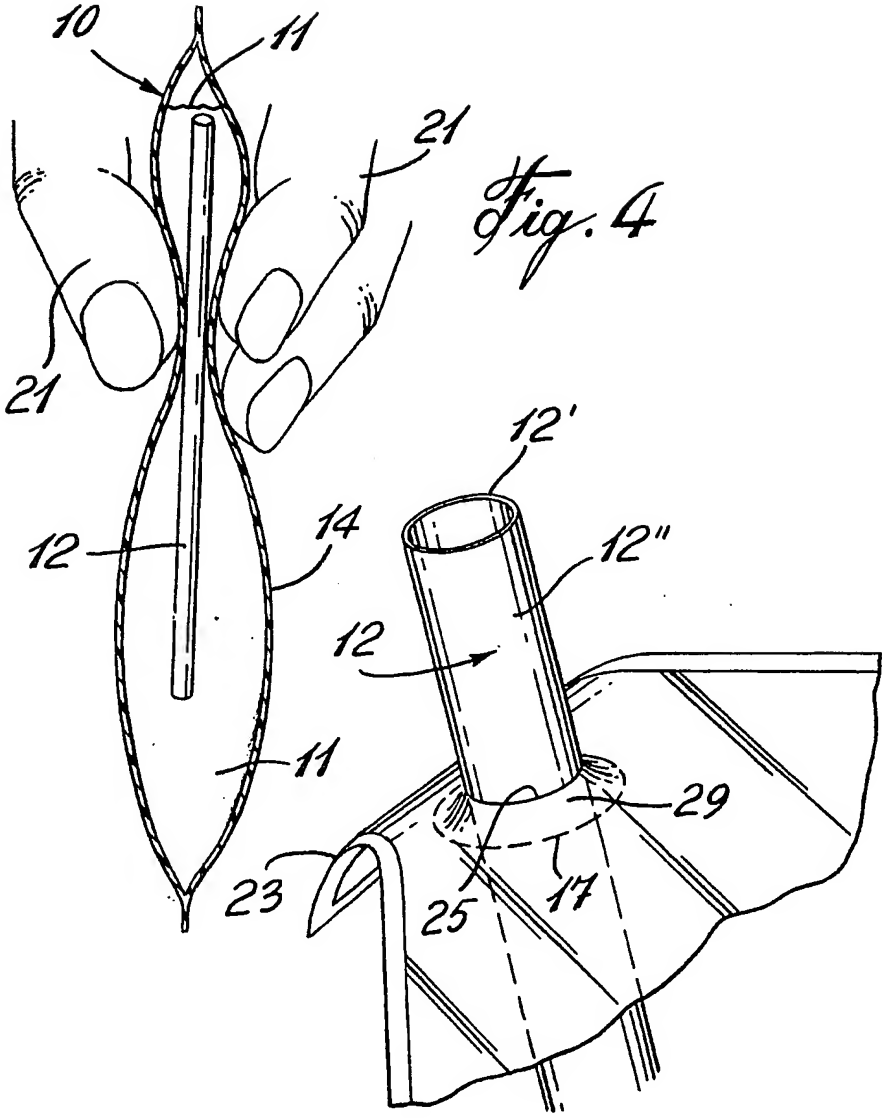


Fig. 4

Fig. 5

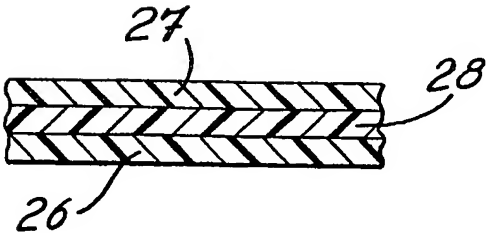


Fig. 6

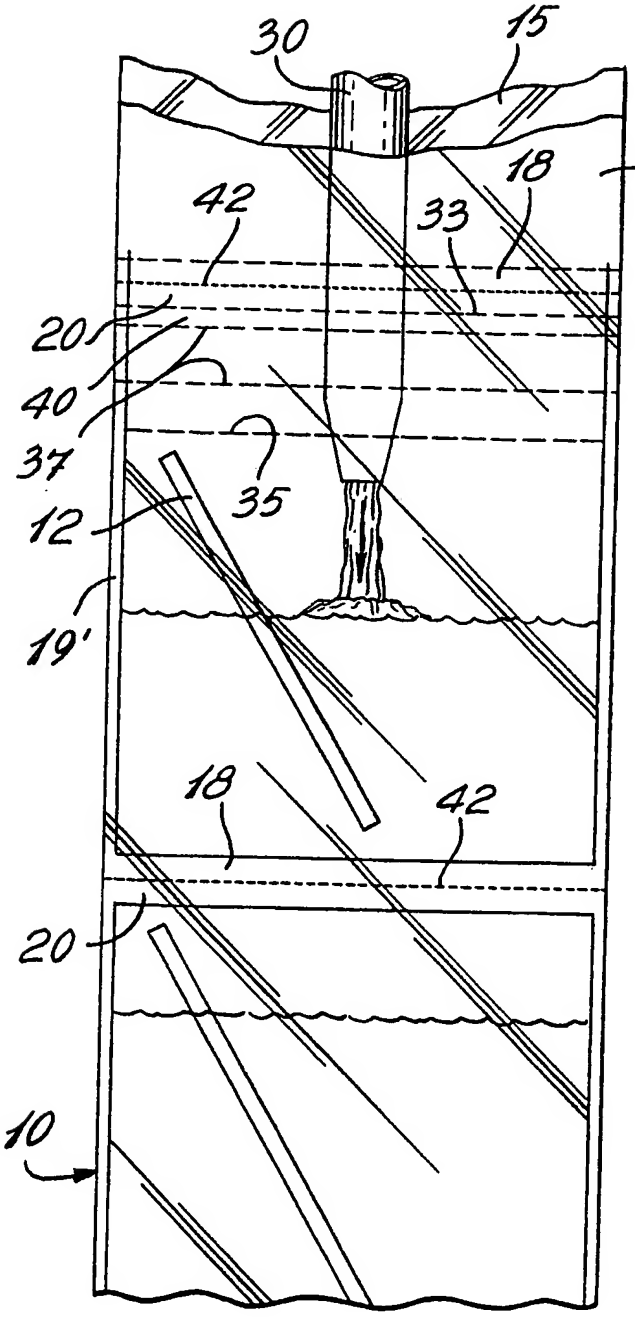

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Fig. 7

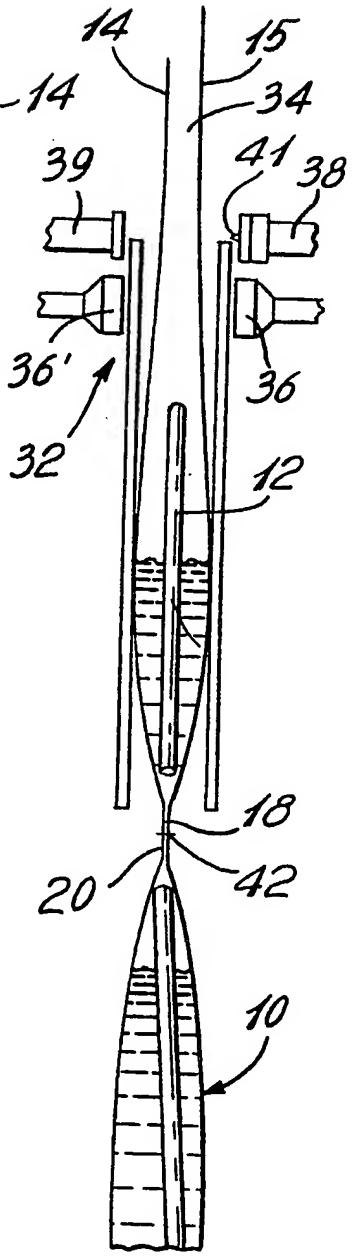
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Fig. 8

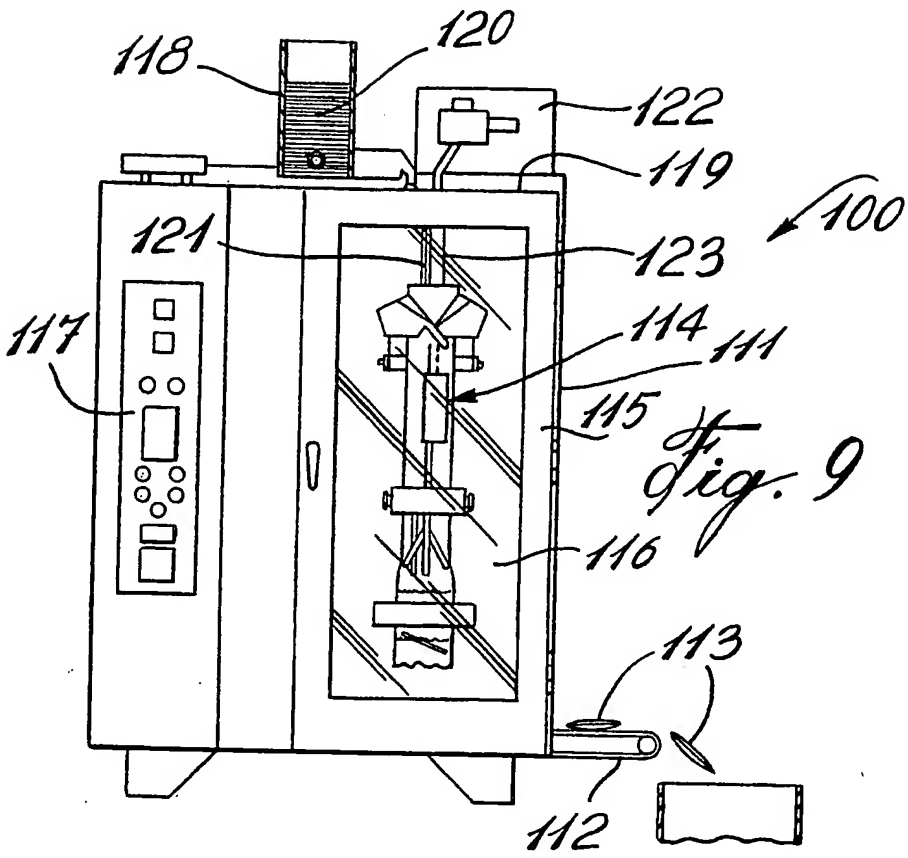
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Fig. 9

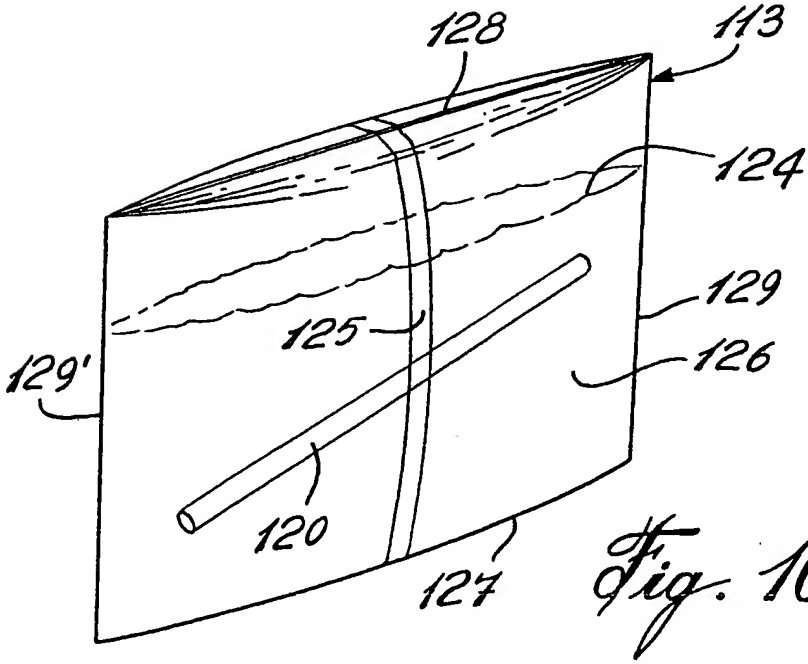
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Fig. 10

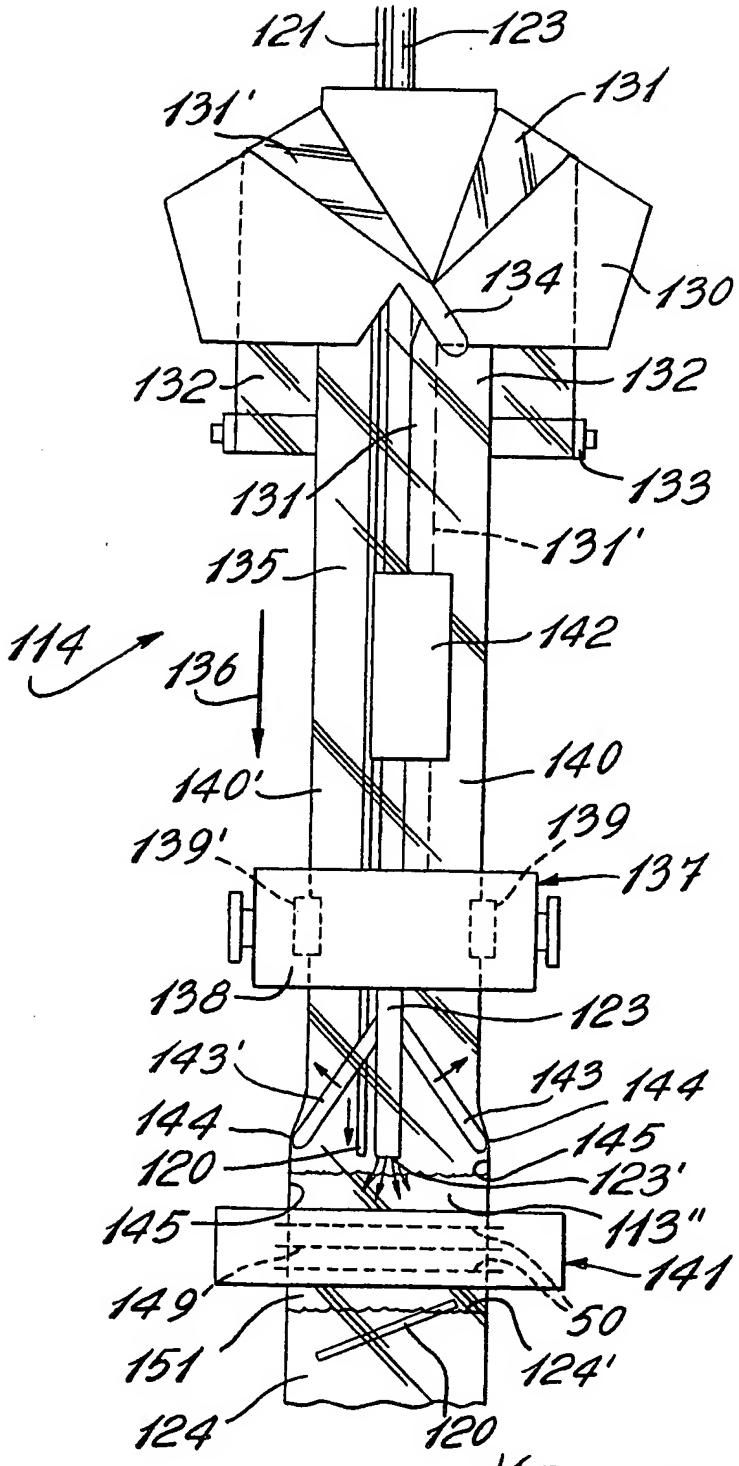
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Fig. 11

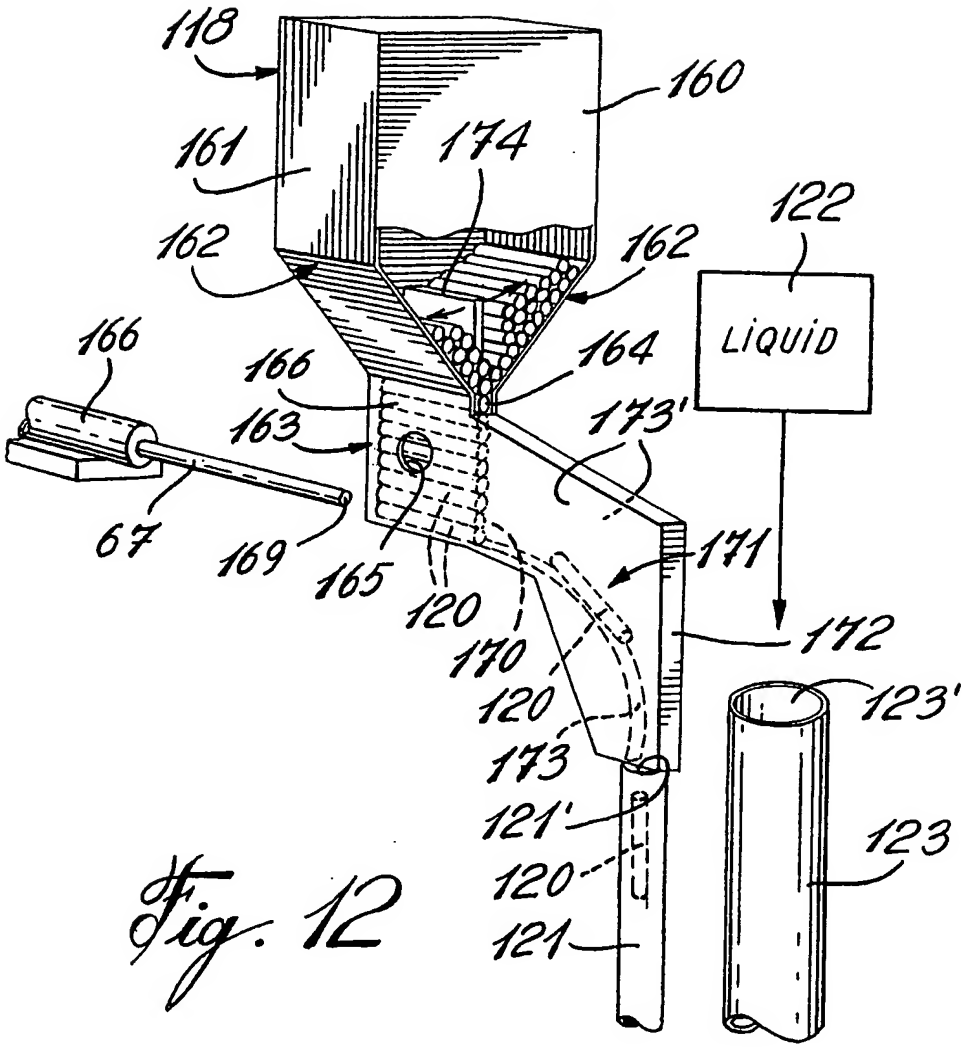
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Fig. 12

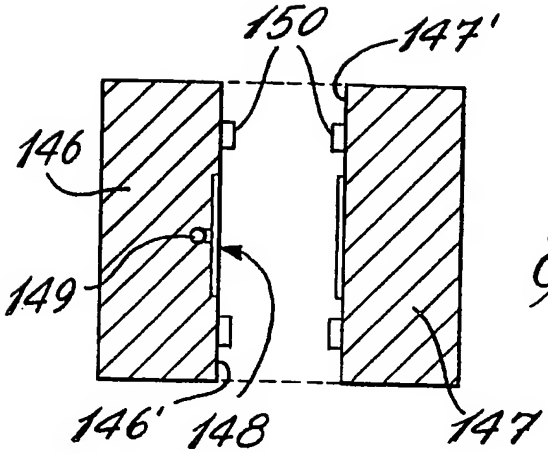

Fig. 13A

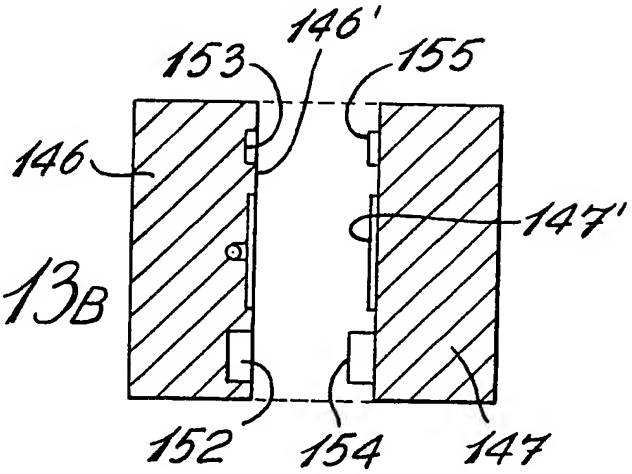

Fig. 13B

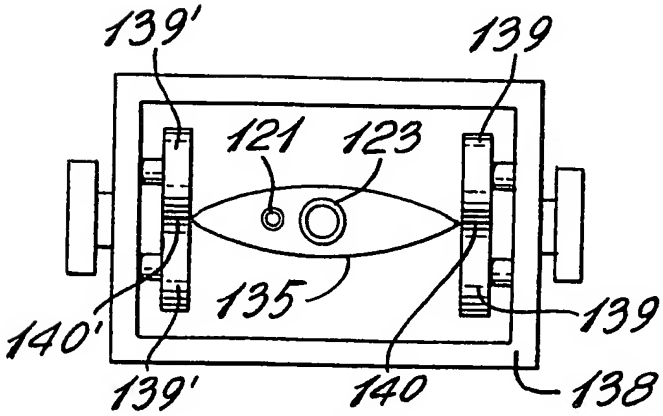

Fig. 14

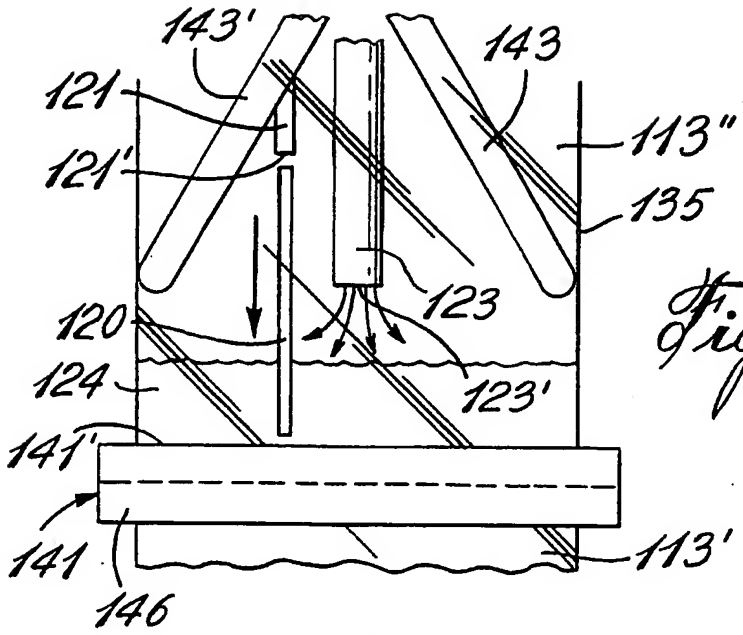

Fig. 15A

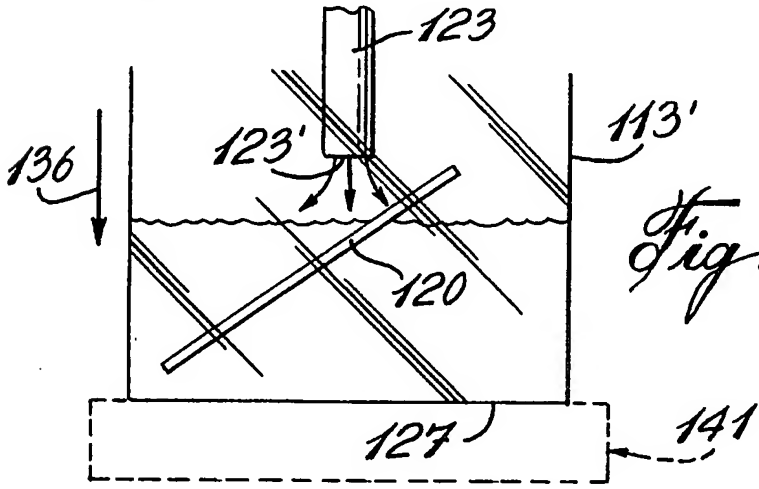

Fig. 15B

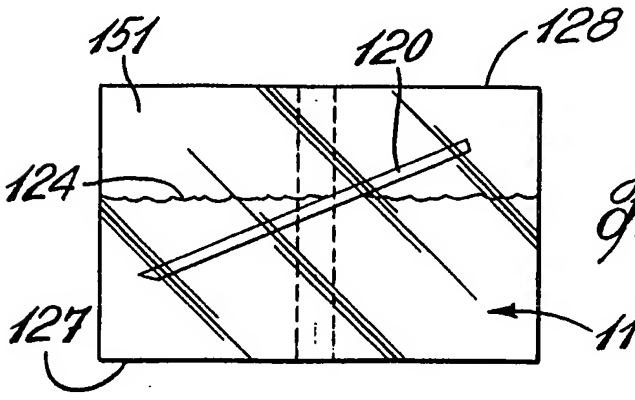

Fig. 15C

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/CA 97/00964

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65D77/28 B65B31/00 B65B61/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B65D B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 4 614 074 A (EVERS) 30 September 1986 see column 3, line 34 - column 4, line 2; figure 1 --- US 3 019 575 A (CHARLEY) 6 February 1962 see column 5, line 14 - line 69; figure 1 --- GB 789 368 A (GLACES GERVAIS) 22 January 1958 see page 2, line 66 - line 69; figure 1 --- US 4 736 572 A (FANG ET AL.) 12 April 1988 see column 6, line 1 - line 30; figure 6 --- -/--	11 12 37 12 15-20,30 1 1,25,26, 37

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 June 1998	07.07.98

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bridault, A

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Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inter ›nal Application No
PCT/CA 97/00964

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 065 599 A (ROWELL) 1 July 1981 see page 2, line 80 - line 98; figure 4	14, 21-24,27
A	EP 0 275 181 A (TAYLOR ET AL.) 20 July 1988 see column 2, line 41 - line 42; figure 3	28
A	GB 1 253 311 A (VEB VERPACKUNGS- UND SCHOKOLADENMASCHINEN DRESDEN) 10 November 1971 see page 2, line 70 - page 3, line 74; figures	37

6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 97/00964

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-10, 37: A pouch with a free-floating straw, which pouch has been partially emptied of its residual air so as to facilitate manipulation of the straw, and a method of forming it.
2. Claims 11-36: A machine and a method for manufacturing pouches with free-floating straws.

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

In tional Application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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